Subject Description Form

Subject Code	**BSE2504**
Subject Title	**Building Services Commissioning**
Credit Value	3
Level	2
Pre-requisite Co-requisite Exclusion	BSE2202 Air Conditioning II, BSE2101 Electrical Installations I Nil Nil
Objectives	1. To enhance knowledge and understanding of the principles of testing and commissioning of building services. 2. To introduce the regulations, safety requirements, and guidance given in local codes of practice & international standards in relation to the testing and commissioning of building services. 3. To develop the skills to select and apply appropriate testing and commissioning procedures for building services.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) interpret and apply appropriate local regulations, safety requirements, codes of practice and international standards to form and plan a strategy for building services commissioning; b) interpret design drawings and evaluate actual installations to assess the commissionability of the building services and to identify and solve potential T&C problems to meet desired conditions; c) develop the skills to select and operate appropriate measuring equipment for testing and commissioning; and d) evaluate measurement results and test data to assess the performance and acceptability of each of the M&E services.
Subject Synopsis/ Indicative Syllabus	**Commissioning Management:** HK Laws, regulations, codes of practice, standards and utility requirements. Safety principles and measures. Roles & responsibilities for commissioning. The commissioning process; design considerations and provisions for testing and commissioning, commissionability reviews, inspection, testing and witnessing, documentation, quality assurance, application to building performance assessment schemes. **Plumbing and Drainage systems**: Inspection and testing of above ground and underground drainage systems including blockage test, water, air and smoke tests. Performance testing of appliances. **Water distribution systems**: System cleanliness, checks before filling, checks prior to pump start-up. Factory test and operational test of water-side equipment. Water regulating devices, instruments for water flow measurement, balancing methods, tolerances. **Air distribution systems:** Procedures of preliminary checks, duct leakage test, factory test and operational test of air handling equipment, air regulating devices, instruments for air flow measurement, air balancing methods, tolerances. **Automatic control systems**: Check-out, calibration and setting-up procedures for valves / dampers / actuators / transmitters / controllers / instruments. Interlocking and overriding devices for sequence control, compressed air supply, connection to electrical supply. Use of relevant standards required for commissioning pneumatic/electrical and electronic control systems. **Fire protection system**: Requirements of commissioned wet fire / dry fire / smoke control systems, procedures of commissioning, initial acceptance testing, fire codes testing, test certificates, statutory insurance requirements, interface with other services. Application of local regulations, British and NFPA standards. **Electrical system**: Requirements of local regulations and standards, initial inspection, check list, primary and secondary injection test on the over current protective device of the main incoming circuit breakers, ductor test on the contact resistance, ring circuit, conductor continuity, protective and bonding, earth electrode resistance, insulation resistance, polarity, earth fault loop impedance, operation of RCD device, capacitor bank, genset, battery charger, battery changeover scheme, completion certificates alteration, periodic inspection and testing. Lighting installation commissioning.

<table>
<tr><td>Teaching/Learning Methodology</td><td>Lectures will be used to introduce topics and applicable engineering knowledge. Tutorials will explore selected lecture topics in greater depth through problem solving and discussion of case studies. Learning will be supported by practical activities such as a workshop on electrical testing, plant room visits, site investigations and laboratory work. Related practical work includes

Inspection and Testing of a Ring Circuit

Testing of IDMTL Over-Current and Earth Fault Relay

Air flow balancing

Balancing of a closed loop water system</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% Weighting</td><td colspan="4">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>Test</td><td>40</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Laboratory reports</td><td>20</td><td>✓</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>Project 1</td><td>20</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>Project 2</td><td>20</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>Total</td><td>100</td><td colspan="4"></td></tr>
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The subject is assessed by coursework (100%). The tests allow students to demonstrate their understanding of applicable regulations and codes of practice by commenting on proposed design provisions and evaluating measurement errors.

Laboratory exercises and reports allow students to demonstrate their ability to evaluate and interpret measured data to determine whether the tested installation(s) can satisfy the design intent.

Project 1 is typically linked with fieldwork and allows students to assess the suitability of T&C provisions of the visited installations and to propose improvements where appropriate.

Project 2 is typically linked with the students' design project. Students can demonstrate their understanding of T&C and their ability to apply relevant regulations and design codes by specifying the necessary design provisions that would enable their services design to be successfully commissioned.</td></tr>
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Student Study Effort Expected	Class contact:	39 Hrs.
	▪ Lecture	16 Hrs.
	▪ Tutorial	6 Hrs.
	▪ Workshop / Seminar	3 Hrs.
	▪ Laboratory & Fieldwork	12 Hrs
	▪ Assessment	2 Hrs.
	Other student study effort:	
	▪ Self study	31 Hrs.
	▪ Laboratory reports	20 Hrs.
	▪ Projects	30 Hrs.
	Total student study effort	120 Hrs.
Reading List and References	ASD, Testing and Commissioning Procedure for Air-conditioning , Refrigeration and Central Monitoring and Control System Installation in Government Buildings of the Hong Kong Special Administrative Region. 2012. Available from http://www.archsd.gov.hk/en/publications-publicity/testing-commissioning-procedure.aspx ASD, Testing and Commissioning Procedure for Electrical Installation in Government Buildings of the Hong Kong Special Administrative Region. 2012. Available from http://www.archsd.gov.hk/en/publications-publicity/testing-commissioning-procedure.aspx ASD, Testing and Commissioning Procedure for Fire Services Installations in Government Buildings of the Hong Kong Special Administrative Region. 2012. Available from http://www.archsd.gov.hk/en/publications-publicity/testing-commissioning-procedure.aspx CIBSE, The Commissioning of Air Distribution Systems, Commissioning Code Series A, The Chartered Institute of Building Services Engineers. TH7653.A47 2006] CIBSE, The Commissioning of Automatic Control Systems, Commissioning Code Series C. The Chartered Institute of Building Services Engineers. [TH6012 .A97 2001] CIBSE, The Commissioning of Water Distribution Systems, Commissioning Code Series W. The Chartered Institute of Building Services Engineers. [TD481 .W37 2010] USGSA, The Building Commissioning Guide, United States General Services Administration, 2005. Available from https://www.wbdg.org/ccb/GSAMAN/buildingcommissioningguide.pdf Wayne G. Carson, P.E., and Richard L. Klinker, P.E, Fire Protection Systems Inspection, Test and Maintenance Manual, 3rd Edition. NFPA. 2000. Wong, C.F., Low Voltage Electrical Installation Handbook, Hong Kong [TK3201 .W66 2004]	